in-operation state is a state in which the laser gas is excited by the electrical discharging from said discharge electrode and the laser light is being outputted.

REMARKS

Applicants request favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

Claims 1, 2, 4-8, 10-15 and 17-20 are now presented for examination. Claims 1, 2, 8, 13 and 20 have been amended to define still more clearly what Applicants regard as their invention, in terms which distinguish over the art of record. Claims 1, 13 and 20 are the only independent claims.

The abstract has been objected to in that the phrase "for producing light amplification through reflection of light between a total reflection window and an exit window" introduces new matter. A replacement abstract is presented in which the objected-to phrase has been changed to "Laser light produced by the electrical discharging is amplified by a total reflection mirror. An output window amplifies the laser light and outputs a portion of the laser light amplified between the total reflection mirror and the output window." The revised wording corresponds to the arrangement shown at least in Fig. 3 and to the disclosure

at least at lines 4 through 11 of page 13 of the specification as originally filed.

Claims 1 through 29 have been rejected under 35 U.S.C. § 112, first paragraph, as allegedly containing subject matter that was not adequately described in the original disclosure. Specifically, the Examiner asserts that the phrase "for producing light amplification through reflection of light between a total reflection window and an exit window", recited in Claims 1, 13 and 20, is not supported by the original disclosure. The objected-to phrase has been replaced in Claim 1 by the recitation of:

"a total reflection mirror for amplifying laser light produced by the electrical discharging from said discharging electrode;

an output window for amplifying the laser light and for outputting a portion of the laser light amplified between said total reflection mirror and said output window;"

As indicated with respect to the abstract, these recitations in Claim 1 are believed to be fully supported at least Fig. 3 and at least by the disclosure at lines 4 through 11 of page 13 of the specification as originally filed. Claims 13 and 20 have been similarly amended. Accordingly, it is believed that Claims 1-29 as amended by this Amendment fully comply with the requirements of 35 U.S.C. § 112, first paragraph.

Claims 1 through 29 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. The Examiner objected to recitations in Claims 1, 2, 8, 13 and 20. With regard to the objection to "the substrate" in Claim 13, it is believed that the term "the substrate" in line 27 of Claim 13 as amended by this amendment has an antecedent basis in "a substrate" at line 22. To expedite prosecution, these claims have been amended in light of the Examiner's comments. Applicants submit that the changes in the amended claims overcome this rejection. Favorable consideration is respectfully requested.

Claims 1 and 20 have been rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 5,770,933 to Larson, et al. With regard to the claims as amended, this rejection is respectfully traversed.

Independent Claims 1 and 20 as amended by this Amendment are directed to a gas laser arrangement and a semiconductor manufacturing method in which a laser gas sealingly stored in a chamber is excited using a discharging electrode that is electrically discharged. Laser light produced by the electrical discharging is amplified by a total reflection mirror. An output window amplifies the laser light and outputs a portion of the laser light amplified between the total reflection mirror and the output window. A blower circulates the laser gas within

the chamber so that the laser gas passing an electrical discharging region of the discharging electrode is circulated in the chamber and is returned to the electrical discharging region of the discharging electrode. The revolutions of the blower are controlled according to the state of electrical discharging from the discharging electrode so that the revolutions of the blower in a stand-by state are less than the revolutions in an in-operation state. The stand-by state is a state in which no laser gas is excited by the electrical discharging from the discharging electrode and so no laser light is emitted whereas an output of the laser light is being prepared. The in-operation state is a state in which the laser gas is excited by the electrical discharging from the discharge electrode and the laser light is being outputted.

In Applicants' view, Larson, et al. discloses a blower motor with adjustable timing for use in a compact excimer laser. The timing adjustment allows a specific motor's performance to be optimized by compensating for individual variations in rotor position sensor characteristics as well as their location. The rotor position sensors may be affixed to a heat sink within a portion of the motor housing. Cooling efficiency of the heat sink is improved by having at least a portion of the motor housing to which the heat sink is thermally coupled cooled through active or passive cooling. The rotor

position sensors may be enclosed by a structure which improves their thermal and electrical isolation. Two brushless DC motors may be coupled to a single drive shaft and a command signal to the motors is automatically varied to obtain a desired drive shaft speed. The drive shaft speed is continuously monitored and compared to a preset maximum limit. If the drive shaft speed equals or exceeds a preset limit the motors are temporarily disabled.

According to the invention defined in Claims 1 and 20, the revolutions of a blower for a gas laser device are controlled with the state of the electrical discharging of a discharge electrode so that the revolutions of the blower in a stand-by state in which no laser gas is excited is made less than the revolutions of the blower in an in-operation state in which the laser gas is excited and laser light is output. Advantageously, making the blower revolutions in the stand-by state smaller is effective to reduce the load on a ball bearing in the rotary shaft support of the blower, saves electrical energy to be consumed by the blower and increases throughput.

<u>Larson, et al.</u> may disclose a motor that rotates a blower of a gas laser device and controlling the speed of the motor. It is disclosed at lines 17-29 of column 7 of <u>Larson, et al.</u> that a system controller monitors the speed of the two motors shown in Fig. 10 so that a controller can command either motor to

increase or decrease drive current. The Larson, et al. disclosure, however, is devoid of any teaching or suggestion of determining the state of discharging electrode as stand-by or in-operation and controlling so that revolutions of a blower in the stand-by state of the discharging electrode are smaller than the revolutions of the blower in the in-operation state of the discharging electrode as in Claims 1 and 20.

It is further disclosed from line 59 of column 7 to line 9 of column 8 in Larson, et al. that an over-speed signal is generated when the motor speed exceeds a set point and the motor is then turned off for a 30 second period. In operation, as disclosed from line 10 to line 45 of column 8 of Larson, et al., the speed of a blower motor is controlled to maintain a desired speed. As a result, Larson, et al. only teaches a desired blower speed for operation and a blower stoppage when there is an over-speed which is directed away from and is completely distinguished from the feature of Claims 1 and 20 of blower revolutions in a stand-by state of the discharging electrode being smaller than blower revolutions in an in-operation state of the discharging electrode. Accordingly, it is believed that Claims 1 and 20 as amended by this Amendment are completely distinguished from Larson, et al.

Claims 1, 2, 4 through 8, 10 through 15 and 17 through 29 have been rejected under 35 U.S.C. § 103 as being

unpatentable over U.S. Patent No. 4,611,327 to Clark, et al. in view of the Larson, et al. patent and U.S. Patent No. 5,383,217 to Uemura and the McKee publication. With regard to the claims as amended, this rejection is respectfully traversed.

Independent Claim 13 as amended by this Amendment is directed to exposure apparatus having a laser source in which a discharging electrode excites a laser gas sealing stored in a chamber by electrical discharging. A total reflection mirror amplifies laser light produced by the electrical discharging. An output window amplifies the laser light and outputs a portion of the laser light amplified between the total reflection mirror and the output window. A blower circulates the laser gas within the chamber so that the laser gas passing an electrical discharging region of the discharging electrode is circulated in the chamber and is returned to the electrical discharging region. A main assembly exposes a substrate to the laser light from the laser light source. A control unit controls revolutions of the blower according to the state of electrical discharging of the discharging electrode so that the revolutions of the blower in a non-exposure-operating state of the exposure apparatus are made less than the revolutions in an exposure operation state of the exposure apparatus. The non-exposure-operation state is a state in which no laser gas is excited by the electrical discharging from the discharge electrode and no laser light is emitted

whereas an output of the laser light is being prepared. The exposure operation state is a state in which the laser gas is excited by electrical discharging from the discharging electrode and the laser light is being output.

In Applicants' opinion, Clark, et al. discloses a high average power, high repetition rate pulsed gas transport leaser system in which a pulse forming network location minimizes electrical discharge loop inductance. RF shielding results from containment of the pulse forming network in a dielectric structure eccentrically mounted within a pressurizable vessel and forming a portion of a high-speed gas flow loop. A gas recirculating blower motor is mounted external to the pressurizable vessel and does not add to the laser system dimensions. The blower is coupled to the blower motor by a magnetic coupling. Blower speed and power can be readily changed. Corona or cold-cathode X-ray pre-ionization is provided in order to provide arc-free gas discharge. Materials compatible with the laser gases are used in construction.

Uemura, in Applicants' view, discloses exposure apparatus using a laser source in which timing of new gas addition and partial gas replacement is controlled so that the exposure apparatus is not adversely affected. The timing is such that gas introduction or replacement occurs during interruption of exposure operation, which does not start again until the

fluctuation of the output of the laser light caused by gas introduction or replacement is stabilized.

McKee, in Applicants' view, discloses various techniques for use in spectral narrowing and tuning of excimer laser oscillators and outlines intra-cavity dispersive elements including littrow grating, grazing-incidence gating, prisms and Fabry-Perot etalons using XeCl, KrF, ArF, XeF and F_2 transitions.

According to the invention of Claims 1, 13 and 20, the revolutions of a blower in a gas laser device or an exposure apparatus with a laser source are controlled according to the state of electrical discharging of a discharging electrode with the revolutions in stand-by or non-exposure-operating state wherein laser light is not emitted being fewer than in an in-operation or exposure operation state wherein laser light is output.

Clark, et al. may teach a gas transport laser system in which blower speed and power can be changed. The only arrangement in Clark, et al. for speed change is taught at lines 3 through 11 of column 12 of Clark, et al. wherein it is disclosed that V-belt drives of the blower motor drive train are the means for allowing adjustments in blower speed. Such V belt drive speed changes do not suggest any arrangement for controlling blower revolutions according to the state of electrical discharging of the discharging electrode of a gas

laser device as in Claims 1, 13 and 20 and Clark, et al. is devoid of any suggestion of any other arrangement for control based on the state of electrical discharging of the discharging electrode of a gas laser device. As discussed with respect to Claims 1 and 20, Larson, et al.'s blower speed changing arrangements are not controlled by the state of electrical discharging of the discharging electrode of a gas laser device. Accordingly, it is not seen that any combination of Clark, et al. and Larson, et al. could possibly suggest the feature of Claims 1, 13 and 20 control of blower revolutions in responsive to the state of electrical discharge of a discharging electrode in a gas laser device.

Uemura is limited to teaching a semiconductor exposing apparatus that exposes a wafer to an excimer laser light. Since both Clark, et al. and Larson, et al. are devoid of any suggestion of controlling blower revolutions according to the state of electrical discharging of the discharging electrode of a gas laser device as in Claims 1, 13 and 20, it is not seen that the substitution of Uemura's exposing apparatus into Clark, et al., Larson, et al. or any combination thereof could possibly suggest the feature of Claims 1, 13 and 20 of controlling blower revolutions according to the state of electrical discharge of a gas laser device discharging electrode. McKee only teaches the use of XeCl, KrF, ArF, XeF and F_2 transitions so that the

addition of McKee to Uemura's exposure apparatus combined with Clark, et al.'s and/or Larson, et al.'s gas laser devices that lack any control based on electrical discharge state is not seen as suggesting the features of Claims 1, 13 and 20. It is therefore believed that Claims 1, 13 and 20 as amended by this Amendment are completely distinguished from any combination of Clark, et al., Larson, et al., Uemura and McKee and are allowable.

A review of the other art of record has failed to reveal anything which, in Applicants' opinion, would remedy the deficiencies of the art discussed above, as references against the independent claims herein. Those claims are therefore believed patentable over the art of record. Applicants submit that the amendments to independent Claims 1, 13 and 20 clarify Applicants' invention and serve to reduce any issues for appeal.

The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual reconsideration of the patentability of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration and

early passage to issue of the present application. The Examiner is respectfully requested to enter this Amendment After Final Rejection under 37 C.F.R. § 1.116.

Applicants' attorney, Steven E. Warner, may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

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